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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/912,652	07/24/2001	Vladimir Segal	30-5004 DIV2	6609

7590 03/01/2006

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EXAMINER	
WILKINS III, HARRY D	
ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 03/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/912,652	SEGAL ET AL.	
	Examiner	Art Unit	
	Harry D. Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *40,50,51 and 54-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *40,50,51 and 54-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1/12/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Status

1. The rejection based on Bunn et al has been withdrawn in view of Applicant's comments regarding the fact that the cutting step of Bunn et al forms the billets, and is not a step of removing portions of the disk.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 54, 55, 58, 59, 62 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Development of a submicrometer-grained microstructure in aluminum 6061 using equal channel angular extrusion" (*Development*, henceforth) with support from Metals Handbook in view of Pouliquen (US 5,087,297).

Development teaches the invention substantially as claimed. *Development* teaches (see second section "Materials and Experimental Procedures") starting with aluminum alloy billets that have been hot extruded. Billets are ingots that have been subjected to deformation, and ingots are the product of casting, thus, the billets of *Development* are a "cast material" as the material was cast during its production. Then the alloy is subjected to a predetermined set of routes of Equal Channel Angular Extrusion (ECAE), which corresponds to the steps of "defining ECAE routes for defining predetermined shear planes and crystallographic directions in the alloy, selecting at

least a route from the defined routes for plastically deforming the alloy during ECAE and subjecting the alloy to a predetermined number of passes through the selected routes".

Extrusion, as defined by the Metals Handbook (page 15), is the plastic deformation of metal by pressing the metal through a die. Forging, as defined by the Metals Handbook (page 18), is the plastic deformation of metal into desired shapes with compressive forces, with or without dies. Thus, extrusion falls under the broad term forging. Hence, the process of *Development* includes hot forging of a cast material.

Development does not teach that the billets (disk) had portions removed to for the sputtering target.

However, Pouliquen teaches (see paragraph spanning cols. 3 and 4 as well as claim 5) that it was conventional in the art to remove portions of a hot forged disk by machining to form the final shape of the sputtering target.

Therefore, it would have been obvious to one of ordinary skill in the art to have removed portions by machining of the produced billet (disk) formed by hot extrusion to produce the final shape of the sputtering target to be subjected to ECAE because the machining step would allow for more precise control of the shape of the produced sputtering target.

Regarding claim 55, Pouliquen teaches the formation of high purity aluminum sputtering targets. Therefore, it would have been obvious to one of ordinary skill in the art to have applied the methodology of *Development* to any of the disclosed compositions of Pouliquen because the method of *Development* improves the microstructure of sputtering targets thereby improving sputtering. The same

metallurgical principles would apply to the high purity aluminum as would apply to the alloy of *Development*, such that one of ordinary skill in the art would have expected the method to produce the same results in other metals. When making the sputtering targets of Pouliquen, the forged shape of an 8-1/2" x 1-1/2" cylinder is considered to be a disk.

Regarding claims 58 and 59, *Development* teaches (see second column of page 2) that special processing steps were studied, including intermediate annealing at 250°C of the material after four passes of ECAE, followed by additional stages of ECAE. The intermediate annealing of *Development* is at 250°C (see second column of page 2), which is below the beginning stages static recrystallization, i.e.-recovery annealing.

Regarding claim 62, *Development* teaches that the alloy is subjected to solution treatment (i.e.-solutionizing) after the hot forging.

Regarding claim 63, as above, *Development* in view of Pouliquen teach a method comprising forging a high purity aluminum material, removing portions of the forged material, defining ECAE routes as claimed, processing the forged material by performing a plurality of passes of ECAE and recovery annealing.

4. Claims 56 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Development* in view of Pouliquen (US 5,087,297) as applied to claim 54 above, and further in view of Park (US 4,589,932).

Development fails to teach the step of homogenization before the hot forging step.

Park teaches (see title, abstract and col. 5, lines 24-35) performing a homogenizing treatment prior to forging/extruding for the purpose of improving strength and high toughness.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied homogenizing as taught by Park to the cast ingot prior to extruding of *Development* for the purpose of improved strength and toughness.

Regarding claim 57, it would have been within the expected skill of a routineer in the art to have applied all three hot steps without intermediate cooling in order to avoid efficiency losses caused by having to reheat the metal.

5. Claims 60 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Development* in view of Pouliquen (US 5,087,297) as applied to claim 54 above, and further in view of "Stress-Relief Heat Treating of Steel".

Development fails to teach that the intermediate annealing is a recrystallization annealing at or above the beginning temperature of static recrystallization.

However, "Stress-Relief Heat Treating of Steel" teaches (see page 33, 1st column) that a heat treatment is applied to workpieces that have developed residual stresses in order to relieve the stresses thereby reducing distortion and preventing stress-corrosion cracking. "Stress-Relief Heat Treating of Steel" teach (see page 33, 2nd column) that residual stresses develop during rolling, casting, forging, bending, drawing or machining. Therefore, one of ordinary skill in the art would have expected the material of *Development* to have residual stresses due to the amount of deformation caused by the ECAE. "Stress-relief treatment" and "recovery annealing" are synonyms.

(Though "Stress-Relief Heat Treating of Steel" is related to a ferrous metal, the same general metallurgical principles hold true for other non-ferrous alloys, such as aluminum.) Time and temperature were known to be result effective variables (see "Stress-Relief Heat Treating of Steel" at page 33, 3rd column), therefore, it would have been obvious to one of ordinary skill in the art to have optimized these process parameters to achieve the proper relief of stresses.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the intermediate stress-relief treatment of *Development* at a higher temperature, such as at a temperature corresponding to the beginning temperature of full static recrystallization or at a temperature at or above the temperature of full static recrystallization, because the stress-relief treatment reduces stresses that cause brittle fracture during further cold working (for support see page 33, 1st column of "Stress-Relief Heat Treating of Steel").

6. Claims 40, 50 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Development of a submicrometer-grained microstructure in aluminum 6061 using equal channel angular extrusion" (*Development*, henceforth) with support from Metals Handbook in view of Park (US 4,589,932) and Pouliquen (US 5,087,297).

Development teaches the invention substantially as claimed. *Development* teaches (see second section "Materials and Experimental Procedures") starting with aluminum alloy billets that have been hot extruded. Billets are ingots that have been subjected to deformation, and ingots are the product of casting, thus, the billets of *Development* are a "cast material" as the material was cast during its production. Next,

the alloy is subjected to solution treatment (i.e.-solutionizing). Then the alloy is subjected to a predetermined set of routes of Equal Channel Angular Extrusion (ECAE), which corresponds to the steps of "defining ECAE routes for defining predetermined shear planes and crystallographic directions in the alloy, selecting at least a route from the defined routes for plastically deforming the alloy during ECAE and subjecting the alloy to a predetermined number of passes through the selected routes". *Development* teaches (see second column of page 2) that special processing steps were studied, including intermediate annealing at 250°C of the material after four passes of ECAE, followed by additional stages of ECAE and then subjecting the material to final annealing, which is a post-extrusion processing to create a specific texture, a uniform grain size and a high texture strength for the alloy.

Extrusion, as defined by the Metals Handbook (page 15), is the plastic deformation of metal by pressing the metal through a die. Forging, as defined by the Metals Handbook (page 18), is the plastic deformation of metal into desired shapes with compressive forces, with or without dies. Thus, extrusion falls under the broad term forging. Hence, the product of *Development* includes both solutionizing and hot forging.

Regarding any additional steps present in the process of *Development*, the present claims recite a method "comprising the steps of", which is read to leave the method open to additional steps, even those which materially change the method.

Thus, *Development* fails to teach the step of homogenization before the hot forging step.

Park teaches (see title, abstract and col. 5, lines 24-35) performing a homogenizing treatment prior to forging/extruding for the purpose of improving strength and high toughness.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied homogenizing as taught by Park to the cast ingot prior to extruding of *Development* for the purpose of improved strength and toughness. It would have been within the expected skill of a routineer in the art to have applied all three hot steps without intermediate cooling in order to avoid efficiency losses caused by reheating the metal.

Thus, *Development* in view of Park do not teach that the metal composition is one of the compositions disclosed and that the billets (disk) had portions removed to for the sputtering target.

However, Pouliquen teaches (see paragraph spanning cols. 3 and 4 as well as claim 5) that it was conventional in the art to remove portions of a hot forged disk by machining to form the final shape of the sputtering target. Pouliquen describe sputtering targets of high purity aluminum.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the methodology of *Development* to any of the disclosed compositions of Pouliquen because the method of *Development* improves the microstructure of sputtering targets thereby improving sputtering. The same metallurgical principles would apply to the high purity aluminum as would apply to the alloy of *Development*, such that one of ordinary skill in the art would have expected the method to produce the

same results in other metals. When making the sputtering targets of Pouliquen, the forged shape of an 8-1/2" x 1-1/2" cylinder is considered to be a disk.

Therefore, it would have been obvious to one of ordinary skill in the art to have removed portions by machining of the produced billet (disk) formed by hot extrusion to produce the final shape of the sputtering target to be subjected to ECAE because the machining step would allow for more precise control of the shape of the produced sputtering target.

Regarding claim 50, the intermediate annealing of *Development* is at 250°C (see second column of page 2), which is below the beginning stages static recrystallization, i.e.-recovery annealing.

Regarding claim 51, the final annealing of *Development* is at 250°C (see second column of page 2), which is below the beginning stages static recrystallization, i.e.-recovery annealing.

Response to Arguments

7. Applicant's arguments with respect to claims 40, 50, 51 and 54-63 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw